

Plant Assessment Form

For use with the “Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands”
by the California Exotic Pest Plant Council and the Southwest Vegetation Management Association
(Warner et al. 2003)

Printable version, February 28, 2003
(Modified for use in Arizona, 07/02/04)

Table 1. Species and Evaluator Information

Species name (Latin binomial):	<i>Pennisetum setaceum</i> (Forsk.) Chiov. (USDA 2005)
Synonyms:	<i>Pennisetum ruppelii</i> Steud., <i>Phalaris setacea</i> Forsk. (USDA 2005)
Common names:	Fountain grass
Evaluation date (mm/dd/yy):	07/10/03
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List committee members:	07/10/03: D. Backer, C. Barclay, D. Casper, R. Haughey, R. Parades, S. Rutman, H. Schussman, J. Ward, P. Warren 09/19/03: D. Backer, C. Barclay, K. Brown, D. Casper, P. Guertin, F. Northam, R. Paredes, W. Sommers, J. Ward, P. Warren
Committee review date:	07/10/03 and 09/19/03
List date:	09/19/03
Re-evaluation date(s):	

Taxonomic Comment

Working Group considered the misnamed *Pennisetum setaceum* “Rubrum” or *P. setaceum* purple-type as a distinct species, *P. advena*, based on Wipff and Veldkamp (1999). Only *P. setaceum* is evaluated here. See **Red Flag Annotation** for additional details.

Table 2. Scores, Designations, and Documentation Levels

Question		Score	Documentation Level	Section Scores	Overall Score & Designations
1.1	Impact on abiotic ecosystem processes	A	Other published material	“Impact” Section 1 Score: A	“Plant Score” Overall Score: High Alert Status: None
1.2	Impact on plant community	A	Reviewed scientific publication		
1.3	Impact on higher trophic levels	B	Other published material		
1.4	Impact on genetic integrity	D	Other published material		
2.1	Role of anthropogenic and natural disturbance	A	Other published material	“Invasiveness” <i>For questions at left, an A gets 3 points, a B gets 2, a C gets 1, and a D or U gets=0. Sum total of all points for Q2.1-2.7:</i> 16 pts Section 2 Score: B	<div>RED FLAG YES</div> Something you should know.
2.2	Local rate of spread with no management	B	Observational		
2.3	Recent trend in total area infested within state	B	Observational		
2.4	Innate reproductive potential	A	Reviewed scientific publication		
2.5	Potential for human-caused dispersal	A	Other published material		
2.6	Potential for natural long-distance dispersal	B	Observational		
2.7	Other regions invaded	C	Other published material		
3.1	Ecological amplitude	A	Observational	“Distribution” Section 3 Score: B	
3.2	Distribution	C	Observational		

Red Flag Annotation

Although *Pennisetum setaceum* is established in a number of ecosystems/plant communities, it is not yet present in many individual occurrences of these types. Large areas of suitable wildland habitat still remain for this species to colonize. The misnamed *Pennisetum setaceum* “Rubrum” (with dark purplish foliage and purplish crimson spikes) or *P. setaceum* purple-type is actually a distinct species, *P. advena*.

Pennisetum advena is sold commercially in Arizona as an ornamental but reportedly does not reproduce reliably from seed and, as a result, was not evaluated.

Table 3. Documentation

Question 1.1 Impact on abiotic ecosystem processes	<i>Score: A Doc'n level: Other pub.</i>
Identify ecosystem processes impacted: Increase in fire occurrence, frequency, and intensity.	
Rationale: Fountain grass raises fuel loads, which increase the intensity and spread of fire (Benton 1997). Fire facilitates its spread (Smith and Tunison 1992 in Lovich 2000). This can set up a positive feedback loop in which fountain grass facilitates fire and fire facilitates fountain grass to the detriment of native ecosystem processes. This process has yet to be documented to any large extent with this species in Arizona. Once in desert grasslands or chaparral, where fire is part of the ecology, the presence of fountain grass is not as serious an ecological threat (T. Van Devender, personal communication, 2004).	
Sources of information: See cited literature. Also considered personal communication with T. Van Devender (Botanist, Arizona-Sonora Desert Museum, Tucson, Arizona, 2004).	
Question 1.2 Impact on plant community composition, structure, and interactions	<i>Score: A Doc'n level: Rev. sci. pub.</i>
Identify type of impact or alteration: Formation of more or less monotypic stands; change in structure due to increase in fire frequency, occurrence, and intensity	
Rationale: Potentially, it can form monospecific stands (Tunison 1992). <i>Pennisetum setaceum</i> is a highly aggressive colonizing plant that is fire-adapted and readily outcompetes its native plant neighbors (Benton 1997).	
In Hawaii <i>P. setaceum</i> dominates areas that formerly supported native <i>Heteropogon contortus</i> grasslands (Williams and Black 1994). Fires that follow invasions by non-native grasses have the ability to change the structure of deserts (Esque and Schwalbe 2000).	
Sources of information: See cited literature.	
Question 1.3 Impact on higher trophic levels	<i>Score: B Doc'n level: Other pub.</i>
Identify type of impact or alteration: Fire has a negative impact on ground nesting birds and terrestrial animals; also community change can occur over time displacing wildlife that depend on intact native community structure.	
Rationale: Fires fueled by fountain grass impact ground-nesting birds and terrestrial animals (Lovich 2000). Losses of cactus, woody shrubs, and trees may eliminate both nesting substrate and protective cover (Esque and Schwalbe 2002). The results (of fires carried by non-native grasses) can be devastating and cause lasting changes in desert communities (Esque and Schwalbe 2000). Current impact on higher trophic levels due to <i>P. setaceum</i> in Arizona is moderate in most infested areas.	
Few reviewed scientific publications exist on this subject. The impact to higher trophic levels without the disturbance of fire is not entirely clear, so the Working Group also considered inference. <i>Pennisetum setaceum</i> is not considered a palatable grass.	
Sources of information: See cited literature. Working Group also considered inference in assigning a score.	
Question 1.4 Impact on genetic integrity	<i>Score: D Doc'n level: Other pub.</i>
Identify impacts: No known direct impact on native species genomes.	
Rationale: There are no native congeners (Kearney and Peebles 1960). Simpson and Baker (1969) reported that a putative purple variety of <i>P. setaceum</i> could set seed as high as 18% following the	

<p>application of pollen from <i>P. ciliare</i> (buffelgrass). Viable seed was produced primarily from pseudogamous development of an aposporous purple <i>P. setaceum</i> egg; however some progenies were hybrids that resulted from a sexual cross (Simpson and Bashaw 1969). As discussed in the Taxonomic Comment following Table 1, Wipff and Veldkamp (1999) determined that the putative purple variety of <i>P. setaceum</i> is actually a distinct species, <i>P. advena</i>. As a result, the above results have implications for the invasiveness of that species, but not for <i>P. setaceum</i>. The finding of Simpson and Baker (1969) that is of interest here is their conclusion “improvement” (that is, improved cold tolerance, uniformity, and fertility) of <i>P. setaceum</i> through a standard breeding program seemed unlikely.</p>
<p>Sources of information: See cited literature.</p>

<p>Question 2.1 Role of anthropogenic and natural disturbance in establishment <i>Score: A Doc'n level: Other pub.</i></p>
<p>Describe role of disturbance: Anthropogenic and natural disturbance are important in the establishment of this species, but it can readily establish independent of any known disturbance.</p>
<p>Rationale: In the southwestern U.S. and northern Mexico, <i>P. setaceum</i> invades natural and disturbed environments (CDFA 2002). It is also found on disturbed sites, roadsides especially near urban areas, and in urban sites (Benton 1997). It often colonizes naturally disturbed riparian and xeroriparian corridors (D. Casper, personal observation, 2003). It has been observed colonizing remote areas without any known natural or human disturbance (S. Rutman, personal communication, 2003).</p>
<p>Sources of information: See cited literature. Also considered personal observations by D. Casper (Biological Technician, National Park Service, Organ Pipe Cactus National Monument, Ajo, Arizona, 2003) and personal communication with S. Rutman (Botanist, National Park Service, Organ Pipe National Monument, Ajo, Arizona, 2003).</p>

<p>Question 2.2 Local rate of spread with no management <i>Score: B Doc'n level: Obs.</i></p>
<p>Describe rate of spread: Increases, but less rapidly than doubling in <10 years.</p>
<p>Rationale: <i>Pennisetum setaceum</i> is increasing in desert regions of the southwestern U.S. (CDFA 2002). <i>Pennisetum setaceum</i> is a highly aggressive colonizing plant that is fire-adapted and readily outcompetes its native plant neighbors (Benton 1997). Fountain grass has been found to have a higher photosynthetic rate, produce more total biomass, and to allocate more biomass to leaves compared to <i>Heteropogon contortus</i> and this may explain the success of <i>P. setaceum</i> as an invader of lowland arid areas on Hawaii (Williams and Black 1994).</p>
<p>Sources of information: See cited literature. Reviewed scientific publications on the local rate of spread of <i>P. setaceum</i> in Arizona were not available; as a result, the score was based on the consensus of the Working Group.</p>

<p>Question 2.3 Recent trend in total area infested within state <i>Score: B Doc'n level: Obs.</i></p>
<p>Describe trend: Increasing, but less rapidly than doubling in total area infested in <10 years.</p>
<p>Rationale: <i>Pennisetum setaceum</i> is increasing in desert regions of the southwestern U.S. (CDFA 2002). Fountain grass has colonized many disturbed habitats along roadways throughout the state (D. Casper, personal observations [Southern Arizona <i>Pennisetum</i> Survey], 2003). It is now invading many wildland areas throughout the southern half of the state.</p>
<p>Sources of information: See cited literature. Also considered personal observations by D. Casper (Biological Technician, National Park Service, Organ Pipe Cactus National Monument, Ajo, Arizona, 2003) as part of the Southern Arizona <i>Pennisetum</i> Survey. As part of this survey, the observer is recording occurrences of the genus <i>Pennisetum</i> as he travels throughout southern Arizona. Digital images, herbarium specimens, and waypoints are collected, compiled, and incorporated into an ArcView project. Because no data currently are available on the trend in total area infested within the state, the score was based on the consensus of the Working Group.</p>

Question 2.4 Innate reproductive potential	Score: A Doc'n level: Rev. sci. pub.
Describe key reproductive characteristics: High reproductive potential.	
Rationale: Reaches maturity in first year, produces seed every year, seed production is sustained over three months per year (D. Casper, personal observation, 2003), seed remains viable in soil for more than six years (Benton 1997, CDFA 2002), viable seed is produced by selfing and crossing, seed production is primarily through apomixis (Simpson and Bashaw 1969), resprouts readily when burned (D'Antonio and Vitousek 1992, Smith and Tunison 1992 in Lovich 2000). See Worksheet A.	
Sources of information: See cited literature. Also considered personal observations by D. Casper (Biological Technician, National Park Service, Organ Pipe Cactus National Monument, Ajo, Arizona, 2003).	

Question 2.5 Potential for human-caused dispersal	Score: A Doc'n level: Other pub.
Identify dispersal mechanisms: High potential for human-caused dispersal; fountain grass is planted as an ornamental, the seed is dispersed by vehicles, humans, and by livestock.	
Rationale: Fountain grass has spread in large part because of its popularity as an ornamental plant (Neal and Seneac 1991 and Hammer 1996 in Lovitch 2000). Fountain grass is easily dispersed by vehicles, humans, and livestock (Cuddihy et al. 1988 in Lovitch 2000). Seed is sold commercially in Arizona (F. Northam, personal communication, 2003).	
Sources of information: See cited literature. Also considered personal communication with F. Northam (Noxious Weed Coordinator, Arizona Department of Agriculture, 2003).	

Question 2.6 Potential for natural long-distance dispersal	Score: B Doc'n level: Obs.
Identify dispersal mechanisms: Natural dispersal agents include wind, water, and possibly birds. There is occasional long-distance dispersal.	
Rationale: <i>Pennisetum setaceum</i> seeds are dispersed short distances by <i>wind</i> (Benton 1997, Jacobi and Warshauer 1992); (seeds are) dispersed by <i>wind</i> , <i>water</i> , and possibly <i>birds</i> (Tunison 1992). Dust devils and strong straight-line wind associated with thunderstorms have the potential to transport the light fluffy caryopsis a long distance (Working Group discussion).	
Sources of information: See cited literature. Score based on inference from the literature and personal observations by Working Group members.	

Question 2.7 Other regions invaded	Score: C Doc'n level: Other pub.
Identify other regions: Invades elsewhere but only in ecological types that it has already invaded in Arizona	
Rationale: Regions invaded include southern half of coastal California, Sacramento-San Joaquin Delta, southern San Joaquin Valley-annual grassland, Mohave and Sonoran Desert Scrub in southern California and Nevada, southern New Mexico, and other communities in Texas, Hawaii, Louisiana, Florida, Tennessee, and Kentucky; also a pest species in Mexico, the Canary Islands, Fiji, and Australia (Lovich 2000, Medio Ambiente Canarias 1999). See Worksheet B.	
Sources of information: See cited literature. Also considered information from Utah State University, developed as part of the <i>Manual of Grasses for North America</i> project. Available online at: http://www.herbarium.usu.edu/webmanual/info.asp?name=Pennisetum_setaceum&type=map .	

Question 3.1 Ecological amplitude	Score: A Doc'n level: Obs.
Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: Occurs in Sonoran desertscrub, Sonoran riparian, and semi-desert grassland (D. Casper, personal observation, 2003), Mohave desertscrub (Longshore and Defalco 2001),	

and Madrean evergreen woodland (D. Casper, personal observations [Southern Arizona <i>Pennisetum</i> Survey], 2003). Planted in Tucson in 1935 (Crider 1935).
Rationale: Occurs in four major ecological types and six minor ecological types (from Worksheet B). Upper elevation recorded is approximately 4800 feet on south facing slopes of Santa Catalina Mountains (specimen collected just below this elevation in Madrean evergreen woodland by R. Barr, No. 60-303, 1960 [SEINet 2003]). Serious threat in rocky canyons such as Sabino Canyon (Catalina Mountains) and King Canyon (Tucson Mountains) (T. Van Devender, personal communication, 2004).
Sources of information: See cited literature. Also considered personal observations by D. Casper (Biological Technician, National Park Service, Organ Pipe Cactus National Monument, Ajo, Arizona, 2003) as part of the Southern Arizona <i>Pennisetum</i> Survey (see question 2.3 for additional details), personal communication with T. Van Devender (Botanist, Arizona-Sonora Desert Museum, Tucson, Arizona, 2004), SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections ; accessed 2003), and observations throughout Arizona by Working Group members.

Question 3.2 Distribution	Score: C Doc'n level: Obs.
Describe distribution: Although <i>P. setaceum</i> ranges widely within Sonoran desertscrub, it is most common in rocky xeroriparian areas; it also is fairly common in rocky Sonoran riparian areas (D. Casper, personal observations [Southern Arizona <i>Pennisetum</i> Survey], 2003; SEINet 2003). It is locally present in Mohave desertscrub (Longshore and Defalco 2001) and in semi-desert grassland and Madrean evergreen woodland (D. Casper, personal observations [Southern Arizona <i>Pennisetum</i> Survey], 2003; SEINet 2003). It is reported to be one of the most widely distributed invasive plants of the Sonoran Desert (Marler 2000). The species thrives along waterlines in reservoirs and along the Colorado River; it can occur as high as 1445 m along the Mount Lemmon Highway north of Tucson (SEINet 2003, T. Van Devender, personal communication, 2004).	
Rationale: The highest percent infested score is C for Sonoran desertscrub and Sonoran riparian. Although <i>P. setaceum</i> is widespread throughout the Arizona Upland subdivision of the Sonoran Desert, it is only locally common, particularly in areas adjacent to development or near road corridors. Within Sonoran desertscrub it is also most commonly found in rocky xeroriparian communities. This species is less common in the Lower Colorado subdivision of the Sonoran Desert within Arizona. When taken as a whole the Working Group determined that >5% to 20% of type occurrences are invaded within both Sonoran desertscrub and Sonoran riparian.	
Although <i>P. setaceum</i> is established in a number of ecosystems/plant communities, it is not yet present in many individual occurrences of these types. The Working Group concluded that large areas of suitable wildland habitat still remain for this species to colonize.	
Sources of information: See cited literature. Also considered personal observations by D. Casper (Biological Technician, National Park Service, Organ Pipe Cactus National Monument, Ajo, Arizona, 2003) as part of the Southern Arizona <i>Pennisetum</i> Survey (see question 2.3 for additional details), personal communication with T. Van Devender (Botanist, Arizona-Sonora Desert Museum, Tucson, Arizona, 2004), SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections ; accessed 2003), and observations throughout Arizona by Working Group members.	

Worksheet A. Reproductive Characteristics

Complete this worksheet to answer Question 2.4.

Reaches reproductive maturity in 2 years or less	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Dense infestations produce >1,000 viable seed per square meter	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	2 pt.
Populations of this species produce seeds every year.	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Seed production sustained for 3 or more months within a population annually	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Seeds remain viable in soil for three or more years	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	2 pt.
Viable seed produced with <i>both</i> self-pollination and cross-pollination	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Has quickly spreading vegetative structures (rhizomes, roots, etc.) that may root at nodes	<input type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Fragments easily and fragments can become established elsewhere	<input type="checkbox"/> Yes	<input type="checkbox"/> No	2 pt.
Resprouts readily when cut, grazed, or burned	<input type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Total pts: 7 Total unknowns: 0			
Score : A			
Note any related traits: 			

Worksheet B. Arizona Ecological Types*(sensu* Brown 1994 and Brown et al. 1998)

Major Ecological Types	Minor Ecological Types	Code*
Dunes	dunes	
Scrublands	Great Basin montane scrub	
	southwestern interior chaparral scrub	
Desertlands	Great Basin desertscrub	
	Mohave desertscrub	D
	Chihuahuan desertscrub	
	Sonoran desertscrub	C
Grasslands	alpine and subalpine grassland	
	plains and Great Basin shrub-grassland	
	semi-desert grassland	D
Freshwater Systems	lakes, ponds, reservoirs	
	rivers, streams	
Non-Riparian Wetlands	Sonoran wetlands	
	southwestern interior wetlands	
	montane wetlands	
	playas	
Riparian	Sonoran riparian	C
	southwestern interior riparian	D
	montane riparian	
Woodlands	Great Basin conifer woodland	
	Madrean evergreen woodland	D
Forests	Rocky Mountain and Great Basin subalpine conifer forest	
	montane conifer forest	
Tundra (alpine)	tundra (alpine)	

*A means >50% of type occurrences are invaded; B means >20% to 50%; C means >5% to 20%; D means present but ≤5%; U means unknown (unable to estimate percentage of occurrences invaded).

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